

RESEARCH REPORT

The size of obesity differences associated with educational level in Spain, 1987 and 1995/97

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J Epidemiol Community Health 2002;**56**:457–460

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Accepted for publication
15 October 2001

Objective: To determine the size of obesity differences associated with educational level in the adult population in Spain.

Design: Three cross sectional studies representative of the adult population in Spain were carried out in 1987, 1995, and 1997.

Setting: The general population in Spain.

Participants: 11 461 men and 10 219 women aged 25 to 64 years.

Main results: For both men and women the obesity prevalence was highest in those with elementary education. In 1987 the obesity prevalence proportion associated with less than third level education (PA) was 24.5% (95% CI 6.0 to 42.8) and 47.9% (15.7 to 71.8) in men and women, respectively. The PAs in 1995/97 were 19.8% (0.2 to 40.2) and 55.1% (21.3 to 72.8).

Conclusions: In 1995/97 the burden of obesity associated with less than third level education was 20% in men and 55% in women aged 25 to 64 years. Between 1987 and 1997 the obesity prevalence proportion associated with less than third level education increased in women and decreased in men.

Since the sixties, social differences in the prevalence of obesity in the developed countries have consistently been observed in the scientific literature. A large number of articles have shown that obesity is more frequent in the less socially advantaged population groups, regardless of whether they are classified by educational level, social class or some other variable of socioeconomic status. This social gradient in the prevalence of obesity has been observed in both women and men, although the association is weaker and less consistent in men.¹

A more recently observed phenomenon in some countries is an increase in social differences in the prevalence of obesity. For example, studies in the United States have shown a greater increase in body mass index (BMI) in population groups with less education, especially in women.^{2,3} In England and Scotland the observed increase in the prevalence of obesity between 1973 and 1982 was larger in manual than in non-manual workers.⁴ In Holland,⁵ Finland⁶ and Spain,⁷ there was a clear increase in social differences in obesity, especially among women.

Although many studies have shown an association between obesity prevalence and socioeconomic status, as well as the generally rising trend of that association, no studies have attempted to quantify the proportion of obesity related with low socioeconomic status. In this study, we analyse less than third level education (elementary and secondary) as a risk factor for obesity. We first estimate the prevalence of obesity in each educational group in men and women aged 25–64 years in 1987 and 1995/97 and then estimate the proportion of obesity prevalence associated with less than third level education. As frequently done with other risk factors for health—smoking or heavy drinking, for example—the proportion of obesity prevalence related with educational level can be interpreted as the burden of disease (obesity) associated with having less than third level education.

METHODS

Source of data

The data were taken from the national health surveys carried out by the Ministry of Health in the adult population in 1987,

1995, and 1997. In these surveys interviews were held with a household sample of persons representative of the non-institutionalised Spanish population aged 16 years and above.^{8–10} The number of persons interviewed in each survey was 29647, 6395, and 6396, respectively. The 1987 sample was made up of 50 provincial subsamples, each of which was selected using a multistage procedure and stratified by size of locality. Because the sampling fraction was not the same in each province, each person in the sample was assigned a weighting coefficient as a function of the province of origin. In contrast, in 1995 and 1997 the samples were self weighted, as in both of those years a single sample was selected at the national level, also using a multistage procedure and stratified by size of locality. To compensate for the difference in sample size, the 1995 and 1997 surveys were combined, so that the estimates in the first period were obtained with the data from the 1987 survey, while the estimates for the second period are based on the data taken from combining the 1995 and 1997 surveys. This study is limited to the population aged 25–64 years, so that the final samples for analysis, after eliminating persons with missing information for some of the variables considered, was 14676 in 1987 and 7004 in 1995/97.

Study variables

We calculated the BMI as weight in kg divided by height in m², using information on weight and height obtained by asking the following two questions: "Can you tell me about how much you weigh without your shoes or clothes on? (in kg)" and "Can you tell me about how tall you are without your shoes on? (in cm)." The response rate to the question about weight and height was 77.8% in the 1987 sample and 86.8% in the 1995/97 sample. Subjects with a BMI ≥ 30 kg/m² were considered to be obese.

Persons were classified by educational level into three categories: elementary level (no education or education completed at 14–15 years), secondary level (education completed at 16–19 years or subsequent non-university studies), and third level (university education). We calculated the obesity prevalence by educational level and the percentage of persons

Table 1 Study subjects, percentage of obese persons by educational level, age, and sex and prevalence ratios (PR) by educational level in men and women aged 25–64 years in 1987 and 1995/97

	1987			1995/97		
	n (%)	% obese	PR (95% CI)	n (%)	% obese	PR (95% CI)
Men						
25–44						
Third level	918 (20.3)	3.7	1.00	408 (19.2)	5.1	1.00
Secondary	1407 (31.1)	3.7	1.12 (0.72 to 1.75)	772 (36.3)	9.5	1.72 (1.07 to 2.75)
Elementary	2203 (48.7)	8.1	2.15 (1.47 to 3.15)	944 (44.4)	11.0	1.94 (1.23 to 3.06)
	4528 (100)	5.9		2124 (100)	9.3	
45–64						
Third level	355 (10.8)	6.3	1.00	162 (10.7)	12.3	1.00
Secondary	369 (11.2)	7.7	1.35 (0.77 to 2.37)	266 (17.5)	10.2	0.85 (0.49 to 1.49)
Elementary	2564 (78.0)	11.1	1.85 (1.18 to 2.89)	1093 (71.9)	18.5	1.47 (0.95 to 2.30)
	3288 (100)	10.2		1521 (100)	16.4	
Women						
25–44						
Third level	660 (16.0)	1.4	1.00	384 (19.2)	2.1	1.00
Secondary	1134 (27.4)	2.6	2.52 (1.08 to 5.89)	634 (31.7)	4.6	2.82 (1.18 to 6.75)
Elementary	2339 (56.6)	6.2	4.53 (2.06 to 9.95)	982 (49.1)	10.4	5.73 (2.53 to 12.99)
	4133 (100)	4.5		2000 (100)	7.0	
45–64						
Third level	124 (4.5)	6.1	1.00	81 (6.0)	6.2	1.00
Secondary	206 (7.6)	6.8	1.12 (0.47 to 2.63)	165 (12.1)	6.7	0.95 (0.33 to 2.73)
Elementary	2397 (87.9)	16.4	2.42 (1.20 to 4.86)	1113 (81.9)	22.7	3.47 (1.48 to 8.17)
	2727 (100)	15.2		1359 (100)	19.8	

in each educational category in men and women for two age groups: 25 to 44 and 45 to 64 years.

Analysis

The proportion of obesity attributable (PA) to less than third level education were calculated using the following formula ¹¹:

$$PA = \frac{\sum_{ij=1}^n (P_{ij})x(PR_{ij} - 1)}{\sum_{ij=1}^n 1 + [(P_{ij})x(PR_{ij} - 1)]}$$

where P_{ij} is the proportion of persons in each category i of less than third level education and in each age group j , and PR_{ij} is the measure of the effect of the association between the risk factor and the disease (obesity) in each educational level stratum i and each age stratum j . The measure of effect used was the obesity prevalence ratio (PR) among persons with an elementary or secondary education with respect to those with third level studies. These ratios were calculated with a binomial regression model ¹² for each age and sex group, using the SAS GENMOD procedure.¹³ The prevalence ratios were adjusted for age. They were not adjusted for other variables and risk factors because these were considered intermediate variables in the association between education and obesity.¹⁴ We calculated 95% confidence intervals for PA using substitution method ¹⁵ taking into account lower and higher confidence limits of both, PR and prevalences of risk factor (elementary and secondary educational level).

PA can be interpreted as the proportion of obesity associated with a less than third level of education, that is, the amount of obesity that we could expected to eliminate if all the population attained a third level of education.

RESULTS

Table 1 shows the distribution of persons included in the analysis and the prevalence of obesity by age, sex, and educational level in 1987 and 1995/97. Most of the population was concentrated in the category of elementary education;

Table 2 Proportion (in %) and 95% confidence intervals of obesity attributable to less than third level education in men and women aged 25–64 years in 1987 and 1995/97

	1987	1995/97
Men		
25–44	23.0 (6.6 to 39.0)	25.3 (5.7 to 44.9)
45–64	26.0 (5.4 to 45.5)	13.5 (–6.1 to 34.6)
Total	24.5 (6.0 to 42.8)	19.8 (0.2 to 40.2)
Women		
25–44	54.7 (23.2 to 76.8)	59.2 (27.8 to 80.2)
45–64	38.6 (6.5 to 64.1)	50.2 (13.6 to 75.8)
Total	47.9 (15.7 to 71.8)	55.1 (21.3 to 78.2)

this percentage was higher in the 45–64 year age group, which included 78% of men and 88% of women. In 1995/97 the percentage of the population with elementary education decreased in all age and sex groups with respect to 1987. The prevalence of obesity was larger in persons with elementary education for both men and women. In the 25–44 year age group, the proportion of obese persons was larger in men than in women, whereas in the 45–64 year age group the opposite was the case. In both sexes the prevalence of obesity was higher in the older age group.

PR for persons with elementary and secondary education with respect to those with third level education, by age and sex are shown in table 1. Persons with elementary education had higher PRs in both 1987 and 1995/97. Likewise, persons with secondary education had higher PRs than those with third level education, except in the 45–64 year age group in the second period. The PRs were higher in the younger age group in both sexes.

In both 1987 and 1995/97, the PRs were higher in women. A differential trend by sex was also seen: whereas in men the PR for those with elementary education decreased between 1987 and 1995/97, in women it increased, rising from 4.53 to 5.73 in the 25–44 year age group and from 2.42 to 3.47 in those aged 45–64.

Table 2 shows the proportions (in percentages) of obesity attributable to less than third level education. In 1987, 24.5% and 47.9% of obesity could be attributed to less than third level education in men and women, respectively. In 1995/97 these PAs were 19.8% and 55.1%.

DISCUSSION

The results obtained indicate that in the second period studied the burden of obesity attributable to less than third level education was 20% in men and 55% in women aged 25–64 years. It was also estimated that between 1987 and 1995/97 the burden of obesity attributable to less than third level education decreased in men and increased in women.

There are two possible reasons for the change in the burden of obesity attributable to less than third level education: a change in the population at risk, that is, an increase or decrease in the proportion of the population with elementary or secondary education, and/or a modification of the effect of education on obesity. The results presented show that between 1987 and 1995/97 the proportion of those with secondary studies rose and the proportion of those with elementary studies declined. On the other hand, the effect of secondary level education on obesity increased slightly in the 25–44 year age group, but decreased in those aged 45–64 years, with the result that its impact on the global burden or PA must have been insignificant. Thus, it is probable that the increased PA in women and the decreased PA in men was attributable to the fact that the effect of elementary education on obesity was higher in the second period than in the first in women, whereas just the opposite occurred in men.

One of the factors postulated to explain the association between socioeconomic variables and obesity is social mobility. Several studies have shown that the social level attained by obese persons is lower than that of the non-obese^{16–17} and that this phenomenon is more clearly seen in women.^{18–19} This magnitude of this social handicap due to obesity seems to be larger than that produced in other chronic conditions, perhaps because obesity is a visible defect, a stigma, that results in a greater degree of discrimination.²⁰ It has been shown that obese adolescent females attain a lower educational level, marry less often, and earn less than the non-obese, and that these results are of lesser magnitude in men.²¹ The influence of social mobility may have increased for unknown reasons between 1987 and 1995/97, which would explain the increased effect of low educational level on obesity, mainly in the 25–44 year age group.

Certain social and cultural factors have also frequently been included in the explanatory models of the socioeconomic differences in obesity, and these factors, together with social mobility, may explain the results found. It has been suggested that social and family pressures to maintain a body image in accordance with reigning social values, where beauty is associated with a slim figure, would exercise a stronger effect in women of a higher socioeconomic status.²² This would explain why there is a larger social gradient in obesity among women than among men. Another phenomenon, which is related with attitudes towards and the internalisation of social values, is the incorporation of people into the labour force, which causes them to confront these values and the need to take them into account. In recent years, women of a high educational level have joined the labour force in greater numbers than those with less education,²³ which could explain the increased effect of educational level on obesity. A relation between BMI and unemployment has also been shown to exist in women, but not in men.²⁴ Given that the unemployment rate has decreased more in Spanish women with a high educational level, this fact may also have contributed to the increased effect of educational level on obesity in women.

It has also been observed that the perception of body weight varies enormously among social groups, and that this

Key points

- The burden of obesity attributable to less than third level of education was 20% in men and 50% in women aged 25–64 years.
- Obesity prevalence could be reduced by 20% in men and 50% in women if people with different levels of education had the same prevalence than those with a third level of education.
- The proportion of obesity associated with less than third level of education increased in women and decreased in men between 1987 and 1997.
- The increase in the proportion of obesity attributable to less than third level of education in women could be attributable to an increase in the risk of obesity in women of less than third level of education.

variation is more important in women. Thus, the percentage of women with a normal BMI who believe that their weight is higher than normal is larger among women with the highest educational level, whereas the absence of perceived overweight is more frequent among women with elementary level education.^{25–27} The greater frequency of perceived overweight persons with a high educational level could lead them to go on reducing diets or take other measures to lose weight in larger proportions than women with elementary level education.^{28–30} It should also be noted that more highly qualified women have greater access to reducing treatments as these entail a certain cost.

The small impact on men of each factor mentioned in the association between educational level and obesity may explain the decreased PA observed in this group. Another factor that mediates this relation in women, but not in men, is reproductive history. This factor has been related with the social gradient in obesity in women because of the cumulative effect of weight gain in successive births, as weight gain during pregnancy is not completely lost at term.³¹ In view of the evidence of an association between socioeconomic status and parity, such that women with lower social level have more children,³² and at an earlier age,³³ this fact may be important in explaining the social differences in obesity among women. An increase has been observed in the percentage of Spanish women with secondary or third level education born since 1950 who have no children, which could explain the increased effect of elementary level education on obesity in women aged 25–44 years.

Certain factors related with individual habits and behaviour may have influenced the results found to some degree. However, several studies have concluded that these types of factors related with habits and behaviour, such as diet and physical activity or alcohol and tobacco use, would not explain more than a small part of the association between socioeconomic status and obesity,³⁴ therefore their impact on the results is likely to have been minimal.

Among the study's limitations, the self reported nature of BMI used in this research may have influenced the results obtained. Although sensitivity of BMI based on self reported weight and height is high, variability by socioeconomic status has been described.³⁵ People at the lowest socioeconomic status report more accurately their weight and height, which may have overestimated the differences found. However, this bias may have been attenuated by the fact that heavier persons (those with lowest educational level) underestimate to a greater degree their BMI.³⁶ Moreover given the magnitude of the effect measures, it is unlikely that the main results would have been materially changed by using measured BMI.

Finally, the results may have been limited by the fact that we have only provided estimates of the PA for less than third level of education, avoiding estimates for secondary and elementary levels separately. Although education is an ordinal

variable and PA could have been presented for every educational level, on behalf of clarity we have presented the results having the upper category of the variable as reference.

The results presented may have some policy implications. The important effect of educational level on obesity showed suggests the need to include education, together with the classic risk factors, among the main factors associated to obesity. The reduction of inequalities in obesity may need, together with actions at the population levels, some other actions directed to people with less educational levels. On the other hand, we need to identify the intermediate factors most strongly implicated in this relation, not only in the attempt to reduce the prevalence of obesity in the population, but also to try to reduce the differences among different socioeconomic groups.

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Funding: none.

Conflicts of interest: none.

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